James Webb Space Telescope Project

Configuration Management Procedure

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National Aeronautics and Space Administration

Goddard Space Flight Center
Greenbelt. Marvland

James Webb Space Telescope Project

Configuration Management Procedure

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JAMES WEBB SPACE TELESCOPE PROJECT
CONFIGURATION MANAGEMENT PROCEDURE

DOCUMENT CHANGE RECORD

REV LEVEL	DESCRIPTION OF CHANGE	APPROVED BY	DATE APPROVED
Basic	Release baseline version per JWST-CCR-000001R1	J. Bryson	11/27/2002

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FOREWORD

This Configuration Management (CM) Procedure describes the National Aeronautics and Space Administration (NASA), Goddard Space Flight Center (GSFC), and establishes the James Webb Space Telescope (JWST) Project CM policies and procedures. This Procedure also defines the objectives, applicability, and responsibility for implementing and maintaining a CM system for the Project. This document is under the control of the JWST Project Configuration Control Board (CCB) and the CCB Chairperson thereto must approve any change or revision. Comments, additions, deletions, and any other pertinent data that may be useful in upgrading this document may be addressed to:

NASA/Goddard Space Flight Center
JWST Project Office, Code 443
Attention: Configuration Management Office
Greenbelt, Maryland 20771

1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) James Webb Space Telescope (JWST) Project will work together with the European Space Agency (ESA) and the Canadian Space Agency (CSA) to achieve overall Project objectives for the development, launch, and operation of the JWST. The respective responsibilities for these organizations are described in the *Memorandum of Understanding Between the European Space Agency and the United States National Aeronautics and Space Administration* (JWST-MOU-1211), the *Memorandum of Understanding Between the Canadian Space Agency and the United States National Aeronautics and Space Administration* (JWST-MOU-1212), and the *JWST Project Plan* (JWST-PLAN-000702).

This Procedure defines the JWST Project policies, procedures, and requirements for Configuration Management (CM) and Configuration Item (CI) baseline document and drawing control. It describes a process that is intended to ensure that all proposed and approved technical and programmatic changes to JWST hardware, software, ground support equipment (GSE), ground system, Ground and Operation Center (G&OC), Science, Launch Vehicle interfaces, testing verification, and associated documents and drawings shall be systematically evaluated for validity, merit, need, and impact. This is to ensure all preventive and corrective actions affecting the quality of these JWST resources are fully documented. In addition, this Procedure satisfies the CM requirements of *the Configuration Management Goddard Space Flight Center (GSFC) Procedure and Guidelines* (GPG 1410.2), and the *Configuration Control Procedure and Guidelines* (400-PG-1410.2.1).

1.1 CONFIGURATION MANAGEMENT (CM) OBJECTIVES

This Procedure defines and describes the CM system to be implemented during the development of JWST flight hardware. The CM system functions defined are as follows:

- Configuration Identification
- Configuration Control
- Configuration Status Accounting
- Configuration Verification

The deployed CM processes provides the means by which the JWST Project Manager may effectively assess and control all proposed changes to Project documentation (contracts, statements of work [SOW], requirements, specifications, plans, procedures, drawings, etc.) that may affect form, fit, function, cost, or schedule. Figure 1-1 shows the major tenets of the CM discipline.

1.2 SCOPE

This Procedure establishes the requirements for the implementation of CM on the JWST Project. This document is applicable to the JWST Project and external organizations under direct contract to the JWST Project (see to Section 7.0). The JWST Project mission development approach includes

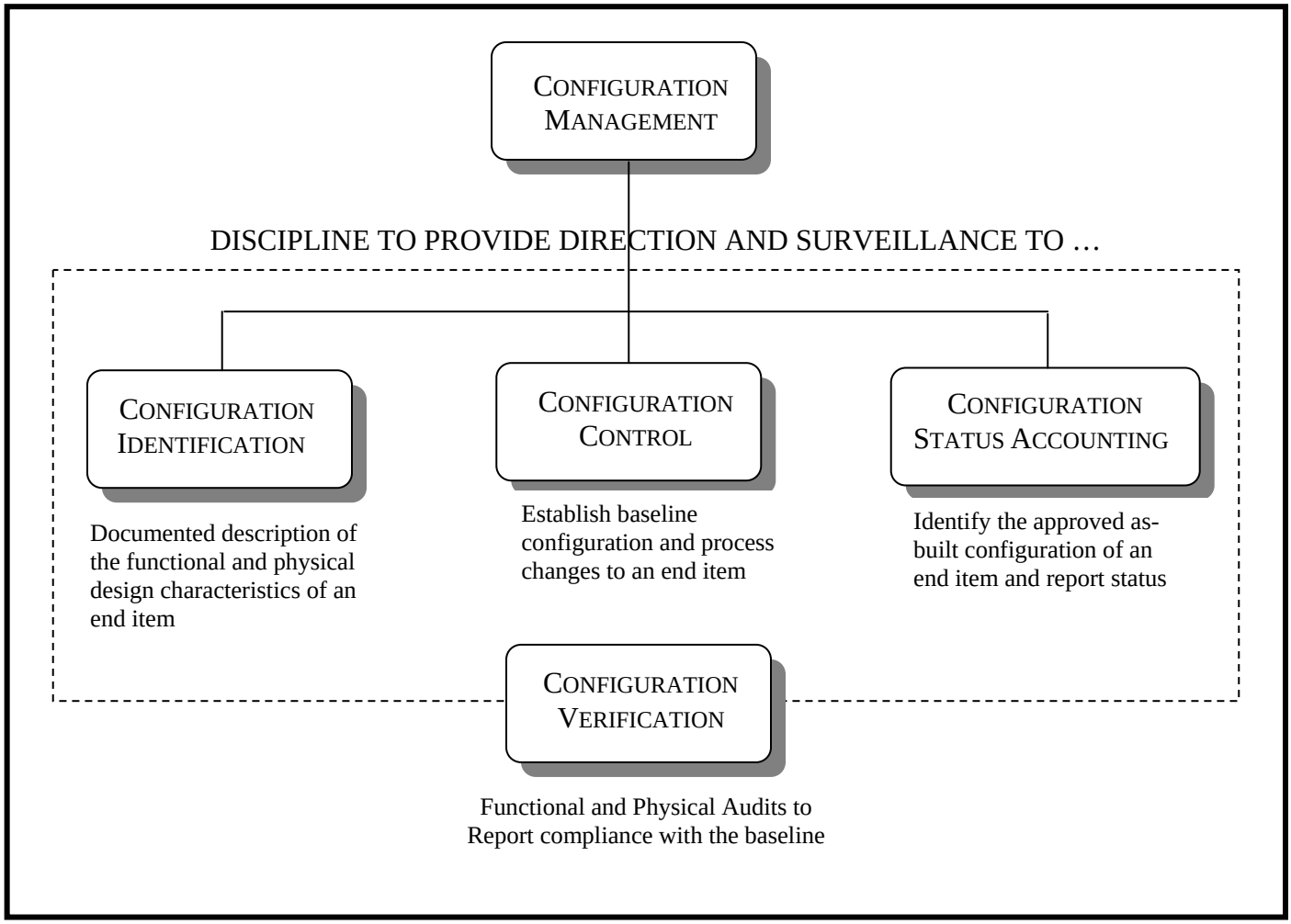


Figure 1-1. CM Discipline Applied to JWST Project Development

major out-of-house elements (e.g. Observatory build and systems integration) and major in-house government furnished equipment [GFE] (e.g., Integrated Science Instrument Module [ISIM]). The requirements and procedures listed herein are applicable to all flight and ground system hardware, software, G&OC, Science, Launch Vehicle interfaces, testing, verification, and their associated documentation.

1.3 REFERENCE DOCUMENTS

The following documents are applicable to this Procedure. In the event of a conflict between this Procedure and the referenced documents, the instructions in this Procedure apply.

GPG 1410.1	Directives Management
GPG 1410.2	Configuration Management
GPG 1420.1	Forms Management
GPG 1440.7	Records Control
GPG 5310.4	Identification and Traceability of Products
GPG 5330.1	Product Processing, Inspection, and Test
GPG 5340.2	Control of Nonconforming Product
GPG 8700.1	Design Planning and Interface Management
GPG 8700.2	Design Development
GPG 8700.3	Design Validation
GSFC Form 18-71	GSFC Engineering Order Form
JWST-HDBK-000668	JWST Configuration Management-Controlled Documentation Style Guide
JWST-PLAN-000702	JWST Project Plan
JWST-PROC-000655	JWST Data Management Procedure
JWST-TREE-000659	JWST Project Document Tree
NPG 1441.1	NASA Records Retention Schedules
400-PG-1410.1.1	Directives Management for Flight Programs and Projects
400-PG-1410.2.1	Configuration Control
400-PG-1440.7.1	Control of Program and Project Records
400-PG-5330.1.1	Work Order Authorization Controls for Code 400 Programs and Projects
500-PG-8700.2.3	Issue and Management of Engineering Drawing Numbers
500-PG-8700.2.5	GSFC Engineering Drawing Standards Manual

1.4 DEFINITIONS

a. Approval Date –date approvers sign the document indicating their approval of the document.

b. Class I Changes – changes that occur when one or more of the following items is affected: 1) baselined documentation (except for typographical errors, simple clarification, or other examples of Class II documentation changes); 2) technical requirements contained in the product configuration items (CI) (form, fit, function); 3) contract end items/requirements (cost or schedule).

c. Class II Changes – changes that do not fall within the definition of a Class I change. Examples of Class II changes are: 1) a change in documentation only (such as correction of errors, addition of

clarifying notes or views); 2) a minor change in hardware (such as substitution with an approved alternative material) which does not affect any item listed under Class I changes; and 3) drawing changes that do not affect a baseline or interface.

d. Configuration Audits – an audit by an organization of the effectiveness of its CM processes, either internally or of its contractor(s).

e. Configuration Baseline – configuration of a product or service, formally established at a specific point in time, which serves as a reference for further activities.

f. Configuration Change Request (CCR) – documented request to issue, change, revise, or delete a controlled document.

g. Configuration Control – the element of CM concerning the systematic proposal, justification, evaluation, coordination, and disposition of approved baselines and changes, and the implementation of approved changes to baseline documentation and products (CIs).

h. Configuration Control Board (CCB) – a designated group of technical and administrative individuals who review and recommend disposition of proposed baseline CIs and changes, revisions, or cancellations thereto.

i. Configuration Documents – documents that define requirements, specifications, design, build/production, validation, and interfaces of a product or service and require document control action before the document can be issued or altered in any way.

j. Configuration Item (CI) – hardware, software, processed materials, services, or any discrete portions thereof, designated for CM and treated as a single entity in the CM process.

k. Configuration Management (CM) – management process for establishing and maintaining consistency of a product's performance, functional and physical attributes with respect to its requirements, design, and operational information throughout its life.

l. Configuration Status Accounting and Reporting – the activity that produces records and reports of CI descriptions and all changes to the CI. It includes the recording and reporting of significant information needed to effectively manage CIs. This includes such activities as maintaining the Controlled Documents List (CDL); status tracking of Configuration Change Requests (CCRs), Work Order Authorizations (WOAs), Drawings, Parts Lists (PLs), and Engineering Orders (EOs); status of CCB activities; and the subsequent reporting of such information to personnel and organizations associated with the Project.

m. Controlled Documents List (CDL) – an organization's list of controlled documents, as described in the organization's document control procedures.

n. Deliverable Items List and Schedule (DILS) – identifies the data deliverables with statement of work (SOW) references, approval requirements, CM requirements for data deliverables to be submitted to the Government by the contractor and includes the schedule of delivery of each item.

o. Deviation – a specific written authorization, granted ***prior to*** the manufacture or testing of an item, to depart from a particular performance or design requirement of a specification, drawing, or document.

p. Data Requirements Description (DRD) – define document requirements, format, and content for all deliverables.

q. Engineering Order (EO) – GSFC Form 18-71 used to request and document changes to engineering drawings.

r. External Document – a document, such as a plan or specification, that comes from an external source and is implemented by the JWST Project. Examples include military specifications and industry standards.

s. Functional Configuration Audit (FCA) – the formal examination of functional characteristics of a CI prior to acceptance to verify that the CI has achieved the requirements specified in its functional document.

t. Material Review Board (MRB) – consists of mandatory representatives that include contractor Quality Assurance (QA), contractor engineering, and GSFC QA, as a minimum, for MRB meetings held at the contractor facility. MRB members will evaluate non-conforming materials and have the authority to disposition the non-conforming materials as one of the following categories: rework, repair, scrap, or use as is.

u. Physical Configuration Audit (PCA) – the formal examination of the "as-built" configuration of a CI against its technical documentation to establish or verify the CI's product baseline.

v. Product Design Lead (PDL) – the manager or leader assigned by the Project Manager, who has overall responsibility for managing the design activity, managing the technical and organizational interfaces identified during design planning, and where required, forming and leading the Product Design Team. The term refers to flight program managers, mission managers, instrument managers, subsystem technical managers, integrated product development team leaders, lead engineers, etc. and others who have the responsibility for managing a design activity. In the context of this document, PDL refers to the "lead engineer".

w. Release Date – date the document is released by the GSFC CMO. A GSFC CMO Release stamp shall be applied to all CM-released documentation.

x. Requirement – (1) A characteristic that a system, HWCI or CSCI must possess in order to be acceptable to the acquirer. (2) A mandatory statement in a standard or another portion of the contract.

y. Specification – A document prepared specifically to support acquisition that clearly and accurately describes essential technical requirements for purchasing. Procedures necessary to determine that the requirements for the materiel covered by the specification have been met are also included.

z. Waiver – a specific written authorization, granted ***after*** the manufacture or testing of an item, to depart from a particular performance or design requirement of a specification, drawing, or other document.

1.5 RECORDS

The CMO shall maintain the following records in accordance with the Configuration Management GSFC Procedures and Guidelines (GPG 1420.2):

Record Title	Record Custodian	Retention
Completed CCR and all attachments	Configuration Management Officer	Retain through life of JWST Program, as applicable. Destroy when 15 years old.

2.0 AUTHORITIES AND RESPONSIBILITIES

2.1 JWST PROJECT MANAGER

The JWST Project Manager is responsible for ensuring that the JWST Project performs the configuration control functions necessary to meet the requirements of the GSFC and NASA. The JWST Project Manager will designate a Configuration Management Officer as the single point of contact to facilitate the Project configuration control activities.

2.2 JWST CONFIGURATION MANAGEMENT OFFICER

The JWST Configuration Management Officer's duties include the management of the CMO, implementing CM procedures, and serving as executive secretary of the Level 2, 3A, 3B, and 3C Project CCBs. In addition, the Configuration Management Officer is responsible for project configuration identification, configuration control, configuration status accounting, interface control, and configuration audits.

The Configuration Management Officer is responsible for ensuring an effective, controlled flow of data through the CCB and shall perform the following:

- Report to Project Manager (or designee);
- Serve as the central point of contact for input, processing configuration changes, control, and distribution of all JWST-generated and deliverable documents and drawings;
- Review CCRs to ensure compliance with Project CM requirements;
- Evaluate documents and drawings as to whether they are to be controlled or reference (uncontrolled) documents based on their type. Controlled documents are tagged as such in the database;
- Schedule CCB meetings with the concurrence of the CCB chairperson by publishing notification memoranda (i.e., setting date, time place, and agenda), and providing review packages to the CCB chairpersons;
- Record minutes of the CCB meetings and distribute copies to attendees;
- Track CCB action items;
- Maintain the CM status accounting system;
- Coordinating changes to baselined documentation with appropriate internal and external organizations;
- Perform periodic formal and informal audits of the functional organizations and contractor's CM systems as directed by Project Manager; and
- Maintain an up-to-date Project Controlled Documents List (CDL);

2.3 SUPPORTING ORGANIZATIONS

2.3.1 Internal GSFC Supporting Organizations and Contractor Support

Internal GSFC organizations and contractors supporting and/or providing JWST hardware and/or to the JWST Project shall comply with the CM processes detailed in this Procedure.

2.3.2 External Partnership

The JWST Project has many major interagency and international support interfaces and is discussed in Sections 2.3.2.1 through 2.3.2.3 below.

2.3.2.1 United States Partners

United States (US) Partners that support and interface with JWST Project(s) are:

- Ames Research Center (ARC)
- Kennedy Space Center (KSC)
- Marshall Space Flight Center (MSFC)
- Jet Propulsion Laboratory (JPL)

The US partner's CM responsibilities are outlined in Section 7.0 of this document.

2.3.2.2 Contractor Partners

The contractor partners under direct contract with the JWST Project(s) are the:

- TRW
- Space Telescope Science Institute (STScI)
- University of Arizona -Tucson/Lockheed Martin Advanced Technology Center (LMATC)

The contractor CM responsibilities are outlined in Section 7.0 of this document.

2.3.2.3 International Partnerships

The international organizations working in partnership with the JWST Project are:

- Canadian Space Agency (CSA)
- European Space Agency (ESA)

International CM responsibilities are discussed in Appendix B of this document (TBD). A MOU, MOA, Letter of Agreement (LOA), or International Agreement governs the application of the JWST CM system regarding these participants.

3.0 CONFIGURATION IDENTIFICATION

Configuration Identification refers to the process of identifying components to be managed as CIs and designating the technical documentation (including requirements, design, hardware and software, specifications, drawings, manuals, and operational procedures) for each baseline developed. Configuration Identification involves allocating required capabilities to CIs, naming and numbering the items, and developing or acquiring technical documentation to describe them.

3.1 CONFIGURATION BASELINES

Baseline documentation initiates formal configuration control, and changes to that documentation must be tracked and approved. Baseline documentation includes, but is not limited to, Specifications, Interface Requirements Document (IRDs), drawings, engineering orders (EOs) against drawings, test documentation, and any other documentation as directed by the Project Manager.

3.2 CONFIGURATION ITEMS

All CI parts, components, and assemblies shall be marked with the unique part number and serial number. Part numbers will be the applicable drawing or specification numbers. All certifications shall use the assigned part numbers and serial numbers to ensure traceability.

For every CI, configuration identification shall be established in the form of hardware numbering and technical documents/drawings. CI selection is the process of separating the elements of a system into individually identified subsets for managing their development. They are selected based upon the need to control the item's inherent characteristics, including interface with other items.

3.3 IDENTIFICATION CRITERIA

As products are developed, new CIs will be identified and included as appropriate into the organization's baseline. One or more of the following criteria should be applicable to be considered an appropriate selection as a CI:

a. Be critical to overall system performance, safety or security
b. Be maintainable and operable as a separate entity and therefore allocable to more than one location
c. Be acquirable in the assembled condition as a subsystem or system-level spare
d. Be capable of separate qualification and/or acceptance testing
e. Be an off-line Project if one of the following conditions apply:

- The status of the Project affects product schedules.
- Changes to the configuration of the Project directly affect the configuration of other CIs.
- The development or maintenance of the Project requires a large expenditure of resources.

f. Be a Commitment or Agreement.

3.4 CONTROLLED DOCUMENTS LIST (CDL)

Baseline CIs (CM-controlled documents) will be incorporated into a CDL that shall contain, as a minimum, the document number, document title, CCB level (controlling organization), revision level, expiration date, and the sponsor's name and phone number in accordance with GPG 1410.2. The Project Manager, or designee, shall determine which documents are to be controlled, baselined, and included on the CDL.

3.5 JWST PROJECT CI IDENTIFICATION

3.5.1 NASA International Traffic in Arms Regulations Sensitive Data

All CM-controlled documents shall contain the applicable statement as described in the *JWST Project Data Management Procedure*, JWST-PROC-000655. It is the responsibility of the document author and/or Government Sponsor to identify documents that contain International Traffic in Arms Regulations (ITAR) sensitive data upon submitting documents for CCB processing. If there is uncertainty whether or not a document contains ITAR sensitive data, the author/sponsor shall contact the JWST Export Control Specialist.

3.5.2 Document and Drawing Trees

3.5.2.1 Document Tree

A Document Tree is a pictorial display of requirement's breakdown from the systems level to the lowest subsystem level where functionally self-contained unit requirements are individually documented. The Document Tree is approved by the Project, assigned a CM-controlled number, approved by the Project Manager, and released by the Configuration Management Officer for control purposes. This format gives a total flow-down picture of specification development requirements on a single sheet. The individual tree entries shall include, as a minimum, the document number, document title, author's name or preparing organization, and expected release date (to be replaced with actual release date). The document tree shall be continually updated to demonstrate status of each document throughout the Project lifecycle.

3.5.2.2 Drawing Tree

The Drawing Tree depicts a hierarchical relationship of drawings from the top-level assembly to the lowest component identified by the drawing. This top-level assembly could be at the CI or system level, as required by the Project. The Drawing Tree is prepared early in the Implementation Phase effort, used as a planning tool for identification and development of required drawings, and provides

insight as to the drawing status and surface design problems. The Drawing Tree hierarchy of drawing should be defined by engineering and reviewed by manufacturing and the QA Representative to ensure that the plan meets their requirements. The Drawing Tree is assigned an engineering drawing number and shall continually be updated to demonstrate status of the drawing development effort as an indictor of engineering progress. Each Drawing Tree entry shall include the drawing title, drawing size, drawing

revision level, outstanding engineering orders (EOs), preparing organization, and planned release date in accordance with the *GSFC Engineering Drawing Standards Manual* (500-PG-8700.2.5). Upon completion of each CI, Drawing Trees shall be signed by the cognizant manger and QA Representative and controlled by the CMO. The Project Top Assembly Drawing Tree shall be approved by the Project Manager and controlled by the CMO.

3.5.3 Document/Drawing Identification and Numbering

All Quality Management System (QMS) directives are controlled using the Goddard Directives Management System (GDMS) and will follow the procedures of GPG 1410.1 and 400-PG-1410.1.1.

All other documentation and drawings shall be controlled using the JWST CM System. All controlled baseline documents, including GDMS documents, must have a CCR before processing. Internal and external documents generated and submitted to the JWST CMO shall receive a JWST CM control number for internal tracking. Documents produced by external organizations and under JWST Project control shall use the approved JWST document format in accordance with the *JWST CM-Controlled Document Style Guide* (JWST-HDBK-000668) and be submitted to the JWST CCB. All external organizations shall obtain from the JWST CMO a JWST document control number for all JWST-Controlled documents generated by external organizations to be delivered the JWST Project.

Only the documents and drawings providing definition of products (components, subassemblies, assemblies, subsystems, and systems) shall be placed under CM control. Documents performing this function include: ICDs, IRDs, procedures, plans, requirements, specifications, SOWs, and MOUs/MOAs/LOAs. All JWST Project-controlled documents shall be identified on the CDL and tagged as such in the database.

3.5.3.1 Document Sponsors

When a need for a document is identified, a sponsor (normally the Product Design Lead [PDL]) will be assigned to that document. The sponsor is responsible for the content of the document and facilitating it through the CCB process.

3.5.3.2 New Documents/Drawings

The process of submitting new documents and drawings to the JWST Project CMO includes the proper assignment of document numbers, baseline identification, and document/drawing submission. **NOTE**: All documents under revision or not formally CM-approved shall be clearly marked as "DRAFT" on the cover page in accordance with GPG 1410.2, *Configuration Management Procedures and Guidelines*.

3.5.3.2.1 Numbering System

Documents and drawings are assigned unique numbers to facilitate identification and tracking of modifications during the change process. Separate numbering systems are used for assigning numbers to drawings and documents.

a. Document Numbering

A document identification number is required in order to submit a document into the CM system, if not intended for inclusion in the GDMS, and shall be assigned to all internally controlled documents. The originator shall obtain a document number at the time the document is being generated.

The JWST Configuration Management Officer is responsible for assignment and registration of all baseline document numbers. JWST-prepared internal documents shall consist of the organization acronym JWST; document type (i.e., RQMT, PLAN, PROC, etc.); a six-digit number assigned sequentially; and (if applicable) a revision letter issued sequentially (i.e., JWST-PLAN-000756, Rev B), in accordance with the *Configuration Control Procedures and Guidelines* (400-PG-1410.2.1, Section 1.2.1).

For all new releases and revisions issued after the effective date of this document, all pages of a document shall have the document number, current revision letter, and expiration date in the header and the following footer shall be placed, at a minimum, on the cover indicating where to confirm the proper revision status:

"CHECK WITH JWST DATABASE AT:
https://ngst1.hst.nasa.gov/
TO VERIFY THAT THIS IS THE CORRECT VERSION PRIOR TO USE."

JWST Project external organizations shall utilize their own document numbering system in accordance with their internal procedures, unless otherwise specified.

In addition to the permanent document identification number, the cover sheet for all JWST-generated CM-controlled documents will include, as a minimum, the document title, the responsible organization's name and code, and an approval/effective date (refer to JWST-HDBK-000668). All documents must have a change revision sheet identifying the changes along with the current revision. The online database and CDL shall reflect the current revision status.

b. Drawing Numbering

The JWST CMO shall obtain and control the drawing numbers used by the JWST Project for in-house development in accordance with the Issue and Management *of GSFC Engineering Drawing Numbers Procedures and Guidelines* (500-PG-8700.2.3). The JWST CMO shall assign individual drawing numbers or blocks of numbers as needed. At the time of assignment, the CMO will request, as a minimum, a preliminary title, expected release date, and the name and phone number of the responsible individual for tracking purposes. The external organization's numbering system may be used unless otherwise directed by the JWST Project.

3.6 DOCUMENTATION RELEASE

All GSFC JWST CM-controlled documents must be formally released with the issuance of a Configuration Change Request (CCR). A new document is released through the formal change control procedure defined in this document and the release and expiration dates added to the cover at the time it

is formally released by the CMO in accordance with GPG 1410.2, *Configuration Management*, and 400-PG-1410.2.1, *Configuration Control*. The expiration date will be five years from the date of release. A notice will be sent out by the CMO when a new or changed document is released with a reminder that superseded/cancelled versions are not to be used.

All GSFC JWST-controlled drawings must be reviewed and approved by the PDL and QA Representative, as well as other required reviewer signatures, as listed in the *GSFC Engineering Drawing Standards Manual* (500-PG-8700.2.5).

3.6.1 New Document Submittal

When a document is ready to be baselined, the electronic version of the document shall be delivered to the JWST CMO (preferably in Microsoft Word format) either by e-mail, diskette, or by placing in an incoming CM directory on the network. All baseline CM-controlled documents require the approval of the JWST Project Manager or designee, via the CCB process. Once the JWST CCB has approved the document for release, the JWST CMO will convert it to Portable Document File (PDF) format, including the original signature sheets. All documents shall be stored electronically and made accessible to Project personnel via the website as "read only".

3.6.2 New Drawing Submittal

In-house GSFC drawings shall conform to the standards specified in the *GSFC Engineering Drawing Standards Manual* (500-PG-8700.2.5). Once a baseline is established, the JWST CMO maintains the master electronic Computer Aided Design (CAD) drawing files, accessible to Project personnel via the website as "read only". The original file and a DXF version of all drawings shall be submitted to the CMO for release and control.

If drawings submitted to the CMO are not drawn in PRO-E™ or in a DWG format, the original hard copy with signatures must be submitted to the CMO. If drawings are not to be approved for an extended period of time, preliminary drawings must be submitted to the CMO for informational purposes. As drawings are revised, the JWST CMO and PDL shall verify proper EO incorporation. To submit new drawings to the CM system, the following steps are followed:

a. During the development and design phases, a drawing number (or block of numbers) shall be obtained from the JWST CMO.

b. When the drawing is complete, the design engineer shall upload the original and DXF version files to the network into a designated incoming directory. E-mail shall be sent to the CMO or the CMO shall be contacted by telephone as notification that the drawing is ready for release. The CMO facilitates the review and approval process. If drawings submitted to the CMO are not in electronic format, the originator is responsible for obtaining signatures on the original drawing and shall submit the drawing to the CMO.

c. Once approval is received, the CMO releases the drawing and uploads it to the network. Paper drawing submittals will be scanned. The CMO will convert the file to PDF format for inclusion

into the JWST web- site database. The CAD file should reflect the names of all of the authorizing individuals in the title block of the drawing. The CAD files are named using the drawing numbers supplied by the CMO (e.g. 1555200-1.dwg or 1555200A1.dwg).

Design changes may require that new drawings be produced or the existing drawing may be modified to include additional configurations (e.g., -1, -2). A new or modified drawing is required for new parts and for parts that have been modified to the extent that they are not interchangeable with existing parts due to form, fit, or function (i.e., new material, dimensional changes, different surface treatment).

Examples such as these do not prohibit a part from being physically interchangeable, but can affect the function of the part and not permit interchangeability.

3.6.3 Document/Drawing Distribution

Each document and drawing will have a specific standard distribution list that will be maintained by the CMO. When documents/drawings are released and published on the JWST website, JWST personnel included on the appropriate distribution list will be notified via e-mail.

For documents, the CMO will release CCB-controlled documents through the JWST Project Library. The CMO will provide the Library with the initial distribution list and sponsor's name for each document.

Distribution of drawings, EOs, parts lists (PLs), work order authorizations (WOAs), and CCRs copies will be the CMOs responsibility.

While contractor/external organization drawings are controlled by the contractor/external organization, the contractor/external organization will have the option to either deliver electronic files of each drawing as released/revised to the GSFC JWST CMO, or make the electronic files available to GSFC/JWST Project personnel via the GSFC/JWST Project website. The method of notification of their release/revision shall be by submittal of a delivery letter to the GSFC/JWST Project.

3.6.4 Superseded/Cancelled/Obsolete Documents/Drawings/Records

3.6.4.1 Superseded/Cancelled Documents

In the event that a document has been superseded or cancelled by another document, the superseded document shall be clearly marked as "SUPERSEDED" or "CANCELLED" and shall be retained in the Project Library for historical purposes. When a document is superseded or cancelled, notification will be sent to the Project personnel via e-mail. Documents that are cancelled or become superseded will be indicated as such on the CDL.

3.6.4.2 Superseded Drawings

In the event a drawing is superseded, follow the instructions located in Section 7.5 of the *Engineering Drawing Standards Manual* (500-PG-8700.2.5).

3.6.4.3 Electronic Files for Superceded Documents/Drawings

Electronic files of superseded documents and drawings shall be stored in a separate location on the database to provide assurance against unintended use. No one has privileges to access these files except the CMO and the network administrator.

3.6.4.4 Superseded GDMS Records

Follow the GDMS guidelines for document retention for superseded records. Cancelled documents will be listed in the database as cancelled. Indication will be provided if the document is or is not replaced by another document. The CMO will send out announcements listing the documents that have been revised or cancelled with instructions to dispose of the superseded documents.

3.6.4.5 Obsolete Documents/Drawings

Electronic files of obsolete documents and drawings shall be stored in a separate location on the database to provide assurance against unintended use. No one has privileges to access these files except the CMO and the network administrator. Additionally, the obsolete files are stored on a compact disk. Obsolete versions of the hard copies that are not records are destroyed. The records that are obsolete follow the GDMS guidelines for document retention. Documents that are cancelled are listed in the database as being cancelled. Indication is also provided if the document is or is not replaced by another document. The CMO will send out announcements listing documents that have been revised or cancelled with instructions to dispose of the obsolete documents.

3.6.5 References to External Documents

Whenever an external document is referenced in a JWST-CM-Controlled document, the current version is assumed. However, if the use of a specific version is desired, the revision information needs to be specified.

3.6.6 Organizational Forms

JWST Project forms shall comply with requirements described in the *Forms Management GSFC Procedures and Guidelines* (GPG 1420.1) and must be controlled in accordance with *Configuration Management GSFC Procedures and Guidelines* (GPG 1410.2) and this document. CM records history shall include the review, approval, and release of the form(s) and subsequent revisions in accordance with the *Configuration Management GSFC Procedures and Guidelines* (GPG 1410.2) and the *NASA Records Retention Schedules Guidelines and Procedures* (NGP 1441.1).

3.7 ONLINE PROCESSING

The online system for submitting drawings, PLs, WOAs, EOs, CCRs, and deviations/waivers is accessible to the Project personnel through the JWST website. The CMO distributes drawings, PLs, WOAs, EOs, CCRs, and deviations/waivers to appropriate Project personnel for review using approved distribution lists. Once the review and approval process has been completed, the CMO will be notified

to release the drawings, PLs, WOAs, EOs, CCRs, and deviations/waivers. The CMO will upload the electronic files of the released drawings, PLs, WOAs, EOs, CCRs, and deviations/waivers in PDF format for viewing by Project personnel.

3.8 DOCUMENT STORAGE

Controlled documentation (i.e., documents, drawings, EOs, PLs, WOAs, LOAs, CCRs, deviations/ waivers, and support documentation) maintained by the JWST Project (including electronic media, hard copy originals, or master copy) will be stored in a safe and secure document control area. Master originals will be released to authorized Project personnel only for incorporation of approved changes. Electronic storage will be write-protected with limited access. A backup system and procedures shall be implemented as disaster backup. This applies to electronic format, hard copy originals, and master copies.

4.0 CONFIGURATION CONTROL

Configuration control is the systematic coordination, evaluation, decision, and release of proposed and approved changes to an established baseline. The objective of configuration control is to ensure that changes are properly and completely defined and presented in such a way that the Project can consider the cost, schedule, and performance impacts of a proposed change, and can control change implementation. For documents, the initial release and subsequent change proposals shall be submitted for review and disposition to the JWST. For drawings, proposed changes shall be submitted to the PDL and QA Representative for review and disposition. Deviations and waivers are also reviewed and dispositioned by the CCB or PDL/QA Representative, as appropriate.

4.1 JWST PROJECT CONFIGURATION CONTROL BOARD ORGANIZATION STRUCTURE

The JWST organization utilizes five CCB levels. Levels one through four are shown in Figure 4-1. The JWST Project manages CCB Levels 2 through 3C while CCB Levels 1, 4, and 5 have the authority to disposition changes for which they are responsible. Each CCB level is defined below:

- Level 1 – NASA Headquarters
- Level 2 – JWST Project (GSFC)
- Level 3A – Observatory (GSFC)
- Level 3B – ISIM (GSFC)
- Level 3C – G&OC (GSFC)
- Level 4 – Contractor, agency, and GSFC internal organizations providing products/services to Level 3
- Level 5 – Subcontractor, agency, and GSFC internal organizations providing product/services to Level 4

Each CCB has been delegated authority for particular documents, milestones, CIs, or monetary limits within the scope of that level. The CCB will assign a disposition to change requests within the authority of that CCB level. The CCB will review and comment on change requests initiated at higher levels. The highest level CCB that has authority in a particular area designates the final disposition of a change request.

Changes affecting higher-level requirements will be submitted, with recommendations, to the next higher-level CCB for disposition.

Flight and ground software configuration control processes shall be established, implemented, managed, and maintained in accordance with *the JWST Project Software Configuration Management Procedure* (JWST-PROC-001649).

In addition, it is the responsibility of the CCB to ensure that the CDL is current.

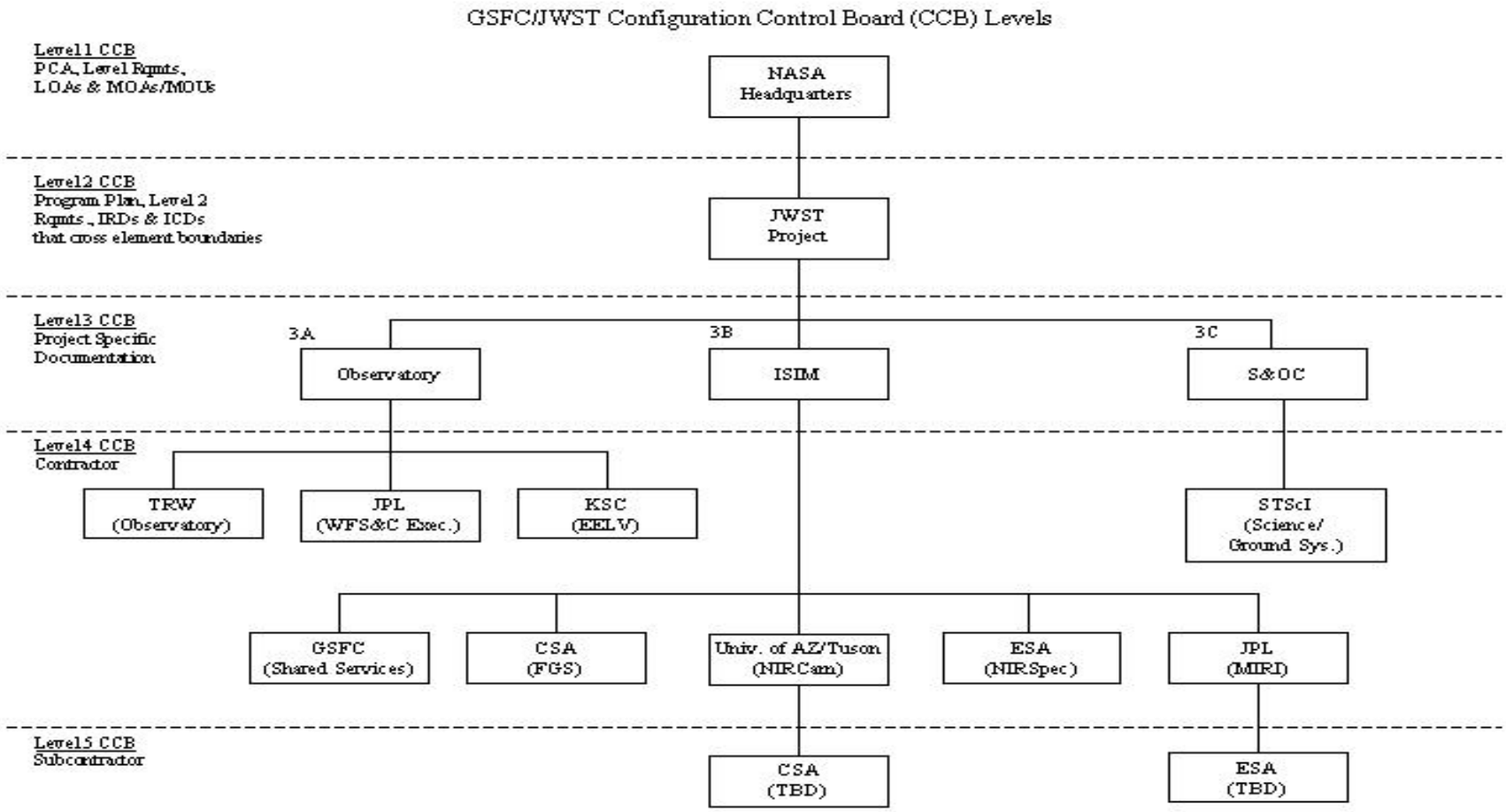


Figure 4-1. GSFC JWST Configuration Control Board (CCB) Levels

The JWST CCB also works in conjunction with the ESA and CSA Configuration Control Boards to establish and control configuration baselines relative to interfaces for the ESA- and CSA-provided system and subsystems (see Sections 4.2.7 and 4.2.8).

4.1.1 Level 1 CCB Organization

NASA Headquarters Office of Space Sciences holds Level 1 CCB authority applicable to Level 1 schedule milestones, JWST requirements, and project/mission objectives.

4.1.2 Level 2 CCB Organization

The JWST Project Office at GSFC/Code 443 has been delegated Level 2 CCB authority. The GSFC/Code 443 is responsible for overall JWST Project management.

4.1.3 Level 3 CCB Organization

The JWST Project Office has delegated Level 3 CCB authority to the GSFC JWST Observatory (3A), ISIM (3B), and G&OC (3C) organizations.

4.1.4 Level 4 CCB Organization

Individual contractors, internal GSFC and external organizations that are responsible for a particular CI or system to be developed or supplied to the JWST Project have been delegated Level 4 CCB authority. Certain CIs have been delegated to Level 4 Product Development Teams (PDTs) that are composed of government and contractor personnel.

4.1.5 Level 5 CCB Organization

Individual organizations or subcontractors that are responsible for a particular CI or system to be developed or supplied to the JWST Project have been delegated Level 5 CCB authority.

4.2 GENERAL JWST CCB RESPONSIBILITIES

4.2.1 Configuration Control Board

The GSFC JWST CCB Levels 2, 3, and internal Level 4 CCBs are responsible for formally evaluating, dispositioning, and documenting its actions relative to proposed changes and ensuring that each change's impact on all specified CIs is considered in terms of performance, cost, and schedule.

The CCBs are responsible for making recommendations to the CCB chairperson for approving, approving with change/comments, disapprove, withdraw, or deferring the following for further study:

- All change proposals that affect form, fit, or functional requirements defined in applicable performance specifications, engineering drawings, and other baseline documents

- All change proposals that exceed the total monies allocated for a particular system and/or contract
- All changes that delay the delivery date beyond that established in the current official Project schedules

4.2.2 JWST Project Manager or Designee

The JWST Project Manager or designee serves as the CCB chairperson and is responsible for establishing the appropriate CCBs, appointing its standing and ad hoc members, presiding over CCB meetings, and exercising final approval/disapproval or concurring with the withdrawal in accordance with CCB recommendations.

4.2.3 Deputy Project Manager

The Deputy Project Manager (DPM) is a permanent member of the GSFC JWST Level 2 CCB and is delegated the responsibility of alternate chairperson by the Project Manager.

4.2.4 Deputy Project Manager/Resources

The Deputy Project Manager/Resources (DPM/R) is responsible for reviewing all matters relating to Project resources, contracts cost, and schedule impacts and makes recommendations to the appropriate CCB level on these matters.

4.2.5 JWST Project Configuration Management Officer (CCB Executive Secretary)

The Configuration Management Officer is responsible for managing the overall JWST Project CM tasks which includes identifying, directing, and coordinating all JWST Project CM activities as specified in this procedure and for implementing all CM procedures as outlined in Appendix B.

4.2.6 Systems Assurance Manager or Designee

It is the responsibility of the Systems Assurance Manager (SAM) or designee to review and evaluate the impact of all proposed changes, deviations, and waivers on system reliability, safety, and product assurance and make recommendations to the CCB. The SAM shall coordinate with Code 300 organizations responsible for reliability, environmental testing, parts, manufacturing processes, materials, computer software assurance, and the Systems Review Office as applicable in making such recommendations. In addition, the SAM shall have coordination responsibility within the JWST Project Office for all changes that involve contract Performance Assurance Requirements (PAR) changes.

4.2.7 Standing Members

Standing members of the GSFC JWST CCBs will be responsible for the following:

- Providing thorough technical review of changes submitted to the CCB

- Attending CCB meetings or sending a designated alternate; and
- Recommending approval, approval with change, disapproval, or withdrawal of the proposed change.

4.2.8 Ad Hoc Members

Ad hoc members of the GSFC JWST CCBs (i.e., Instrument, Subsystem Leads, Financial, Scheduling, representatives from partnering organizations, etc.) will be responsible for:

- Reviewing proposed changes based on their particular expertise;
- Supporting meetings when specifically requested; and
- Recommending approval, approval with change, disapproval, or withdrawal of the proposed change.

4.2.9 ESA Configuration Control Board

The ESA Configuration Control Board, in conjunction with the JWST CCB, is responsible for proposed changes affecting the definition of each other's systems.

4.2.10 CSA Configuration Control Board

The CSA Configuration Control Board, in conjunction with the JWST CCB, is responsible for proposed changes affecting the definition of each other's systems.

4.3 CONFIGURATION CONTROL BOARD MEETINGS

The Configuration Management Officer acts as Executive Secretary for the GSFC JWST Project Level 2 and 3 CCBs. JWST CCB meetings shall be convened as required. The Configuration Management Officer is responsible for the preparation of CCRs for dissemination to CCB attendees. The CCB chairperson may convene emergency CCB meetings at any time.

4.3.1 CCB Agendas

CCRs will be added to the agenda when all response sheets have been returned to the CMO. For all response sheets not returned to the CMO by the designated due date, the CMO will contact all the delinquent reviewers to obtain their response sheets. The CMO will review comments received to see if the responses have any CM-related issues. Technical issues will be coordinated with the CCR sponsor or author. Technical issues may cause the CCR to be removed from the proposed agenda and may cause the CCR to be reworked or withdrawn. The CM tracking database will track this type of non-routing action.

Once CCRs are ready for CCB action, the JWST CMO will issue an agenda prior to the scheduled CCB meeting. The agenda will include the date, time, location of the meeting and the agenda items to be discussed. The agenda will be published one week prior to the scheduled meeting and will be

posted online. The CMO will send an e-mail notifying the CCB participants the agenda has been posted. Original agendas will be stored in the appropriate CCR package in the CMO.

4.3.2 CCB Disposition

Proposed changes are reviewed at the JWST CCB meeting with input from all CCB members and ad hoc invitees. The final decision to approve, approve with change, disapprove, withdraw, or defer is the responsibility of the JWST Chairperson. The JWST CMO will record and distribute the technical minutes and action items of each JWST meeting. CCRs are dispositioned using one of the following categories: approve, approve with change, disapprove, or withdraw. Disapproved/Withdrawn CCRs will be kept on file in the CMO with no action. Deferred CCR packages are maintained by the CMO to await completion of action(s) resulting from the CCB meeting.

4.3.3 CCB Action Items

4.3.3.1 CCB Action Item Process

The CMO shall document the CCR disposition and any assigned action items recorded in the CCB minutes. The CMO shall also enter all action items into the Action Item database and update as necessary through action item closure.

4.3.3.2 CCB Action Item Closure

Action items recorded in the CCB minutes shall be accomplished by the actionee by the due date imposed by the CCB and reflected in the minutes. Action items shall be closed only when the CMO is provided copies of the acquired documentation. Upon receipt, the CMO shall verify fulfillment of action items with appropriate CCB/Project personnel. **NOTE**: Action item due dates may only be modified/extended when the CCB Chairperson or designee agrees with the proposed date change. Upon approval, the Configuration Management Officer shall make the necessary modification(s).

4.3.3.3 Contract Action

The appropriate contract action change order, Request for Proposal (RFP), bilateral modification, or contracting letter of direction, will be implemented for all approved CCRs. A notification of disapproval shall be issued for all CCRs rejected by the JWST Project CCB.

4.3.4 CCB Minutes

The JWST CMO will generate technical minutes of CCB meetings. The minutes record the list of attendees, CCRs discussed, the CCB recommendations, CCB disposition, procurement priority, and assigned CCB actions. The minutes are used by the CCB Chairperson to direct a person(s) or organization(s) to complete actions assigned by the CCB. Where appropriate, the minutes may include a schedule for verification of change implementation. The CCB Chairperson shall sign the meeting minutes and the CMO will post the minutes on JWST website. Original minutes will be filed in the CMO and a copy will be kept in the CCR folder.

Evaluation and authority for implementation of Class I and II changes will be by direction of the Project Manager or his/her designee. No other individual or participant may direct the implementation of approved changes.

4.4 CONFIGURATION CHANGE CLASSIFICATIONS

Class I document changes impact form, fit, function, cost, or schedule of a design item that has reached a baseline point. Class I document changes require a CCR, Figure 4-2. Configuration changes may affect hardware, software, firmware, verification requirements and the documents, drawings and procedures defining them. Class II document changes are changes of an editorial nature, minor corrections, or changes that do not affect interchangeability. Only an EO form, Figure 4-3, is required for drawing changes and deviations/waivers. External organizations will submit proposed changes to the responsible JWST Project PDL for verification of classification.

4.4.1 Configuration Change Requests (CCRs)

Figure 4-4 illustrates the Project CCR flow.

4.4.1.1 CCR Sponsor Responsibilities

A government sponsor will be assigned to each CCR upon initiation. The CCR sponsor may be a member of the JWST Project, Observatory, ISIM, or G&OC organizations. Sponsors will be assigned according to the following criteria:

- A Change affecting a Level 2 or 3 baselined document or software system will be sponsored by the staff member assigned as monitor for that document or system.
- A change affecting the scope of a Level 4 contract or MOU will be sponsored by the technical officer (TO) or equivalent for that contract or MOU.
- A change affecting other systems, software, or documents not included above will be assigned to the staff member whose area of responsibility is most affected by the change.

The sponsor's name will appear on the CCR form. The Configuration Management Officer will forward all CCR inputs that reflect disapproval or comments to the author/sponsor as received. The author/sponsor will coordinate and assess these inputs to determine their validity or merit.

The Configuration Management Officer will notify the sponsor when the CCR is ready to be scheduled for the CCB. A consolidated recommendation form shall be completed and forwarded to the Configuration Management Officer by the sponsor prior to the CCB meeting for that CCR. The sponsor will attend the CCB meeting to present the CCR and the CCB recommendation for disposition. The sponsor will assess Level 2 or NASA Headquarters Level 1 disposition; for those changes requiring these approvals, to ascertain the impact if these dispositions conflict with JWST Project disposition. The sponsor is responsible for facilitating their CCRs that are submitted to NASA Headquarters (HQ) for approval, when applicable.

4.4.1.2 Initiating a CCR

Any JWST personnel may initiate a CCR to the appropriate CM baseline, with the agreement of the document sponsor, utilizing the JWST website. The CMO will assist the sponsor in assembling the CCR package. The CCR package consists of the CCR and proposed document change pages. The CCR package is forwarded to the CMO through the online database system to begin the process. Proposed changes, deviations, and waivers submitted by external participants (i.e. contractor, agency) will be submitted the appropriate Government sponsor to be assessed. If the Government sponsor agrees, the Government sponsor will complete an JWST CCR form and forward along with the external proposed change documentation to the JWST CMO to be processed. In the event that the Government sponsor does not agree with the proposed change, the Government sponsor shall contact the submitting external participant to work through any issues.

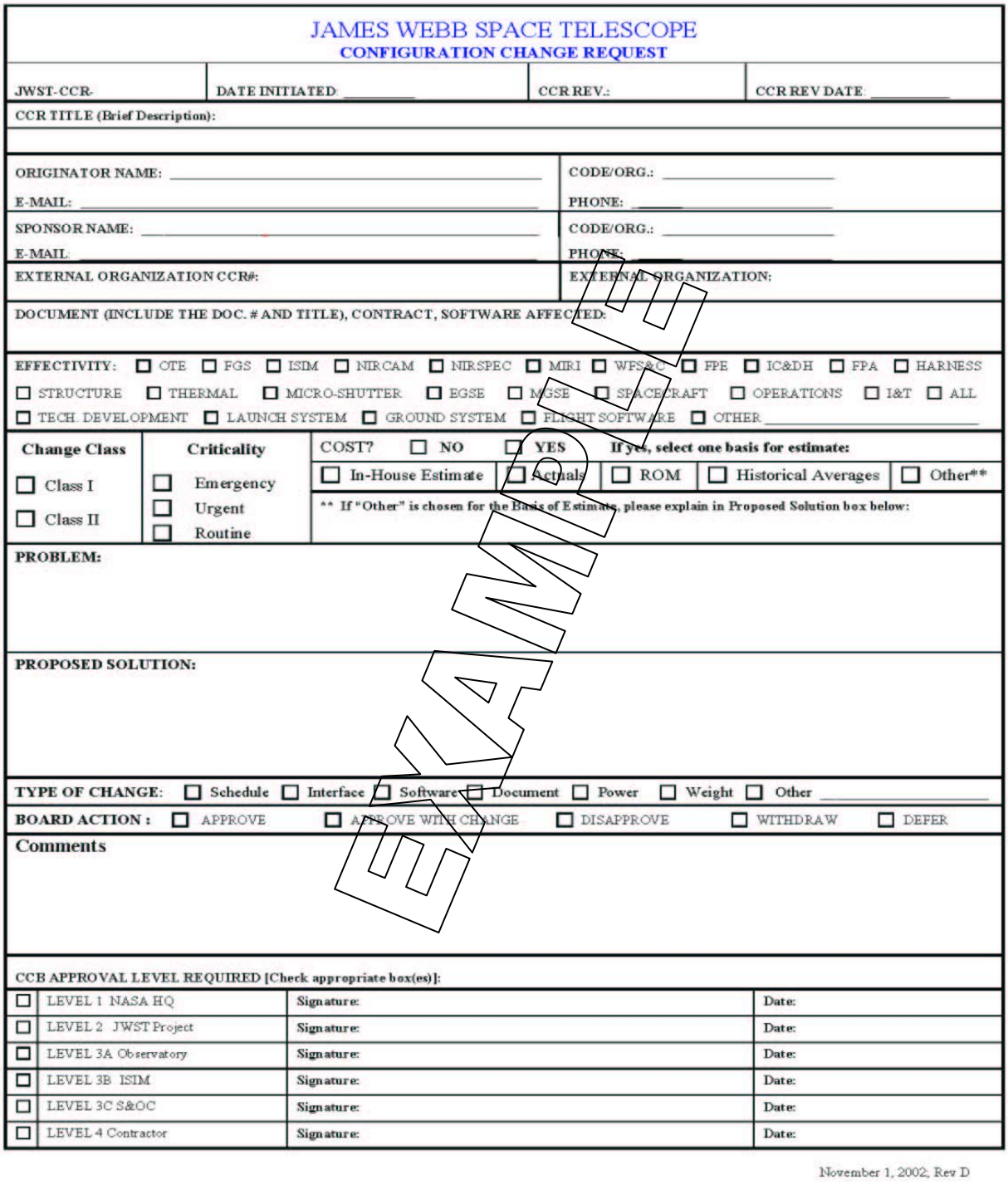
As a minimum, the CCR must contain the following information:

a. Initiators name, organization code, and e-mail address;
b. Date submitted;
c. Document number, title, and revision level of document to be changed;
d. Effectivity (e.g., specific documents and/or hardware affected);
e. Complete technical description of proposed change(s), including specific referenced document(s) and document rewording necessary to effect the change;
f. Complete rationale for proposed change(s);
g. Change priority: routine, urgent, or emergency;
h. ROM, cost, and delivery impact, if applicable;
i. Schedule for completion, anticipated impact on the overall schedule, and the reason therefore; and
j. Procurement requires the “Procurement Change Order Classification”.

The originator and/or sponsor are required to prepare the CCR, proposed change pages, and support documentation. The CCR, proposed change pages, and support documentation shall be submitted to the CMO to begin the CCB process.

4.4.1.3 CCR Process

The Project CMO is responsible for processing CCRs and checking to ensure all affected requirements are identified. The CMO will assess CCRs for completeness and accuracy, and verify baseline integrity. For each CCR, the CMO will assign a unique sequential CCR number, enter CCR information into the system, and begin the Project CCB review process. The online CCR database will maintain up-to-date information about each CCR as it progresses throughout the CCR life cycle.



JAMES WEBB SPACE TELESCOPE
CONFIGURATION CHANGE REQUEST

JWST-CCR:	DATE INITIATED: _____	CCR REV.:	CCR REV DATE: _____

CCR TITLE (Brief Description):

ORIGINATOR NAME: _____ CODE/ORG.: _____
E-MAIL: _____ PHONE: _____

SPONSOR NAME: _____ CODE/ORG.: _____
E-MAIL: _____ PHONE: _____

EXTERNAL ORGANIZATION CCR#: EXTERNAL ORGANIZATION:

DOCUMENT (INCLUDE THE DOC. # AND TITLE), CONTRACT, SOFTWARE AFFECTED:

EFFECTIVITY: ☐ OTE ☐ FGS ☐ ISIM ☐ NIRCAM ☐ NIRSPEC ☐ MIRI ☐ WFS&C ☐ FPE ☐ IC&DH ☐ FPA ☐ HARNESS
☐ STRUCTURE ☐ THERMAL ☐ MICRO-SHUTTER ☐ EGSE ☐ MGSE ☐ SPACECRAFT ☐ OPERATIONS ☐ I&T ☐ ALL
☐ TECH. DEVELOPMENT ☐ LAUNCH SYSTEM ☐ GROUND SYSTEM ☐ FLIGHT SOFTWARE ☐ OTHER _____

Change Class	Criticality	COST? ☐ NO ☐ YES If yes, select one basis for estimate:
☐ Class I ☐ Class II	☐ Emergency ☐ Urgent ☐ Routine	☐ In-House Estimate ☐ Actuals ☐ ROM ☐ Historical Averages ☐ Other** ** If "Other" is chosen for the Basis of Estimate, please explain in Proposed Solution box below:

PROBLEM:

PROPOSED SOLUTION:

TYPE OF CHANGE: ☐ Schedule ☐ Interface ☐ Software ☐ Document ☐ Power ☐ Weight ☐ Other _____

BOARD ACTION : ☐ APPROVE ☐ APPROVE WITH CHANGE ☐ DISAPPROVE ☐ WITHDRAW ☐ DEFER

Comments

CCB APPROVAL LEVEL REQUIRED [Check appropriate box(es)]:

☐	LEVEL 1 NASA HQ	Signature:	Date:
☐	LEVEL 2 JWST Project	Signature:	Date:
☐	LEVEL 3A Observatory	Signature:	Date:
☐	LEVEL 3B ISIM	Signature:	Date:
☐	LEVEL 3C S&OC	Signature:	Date:
☐	LEVEL 4 Contractor	Signature:	Date:

November 1, 2002, Rev D

Figure 4-2. Example of JWST CCR Form

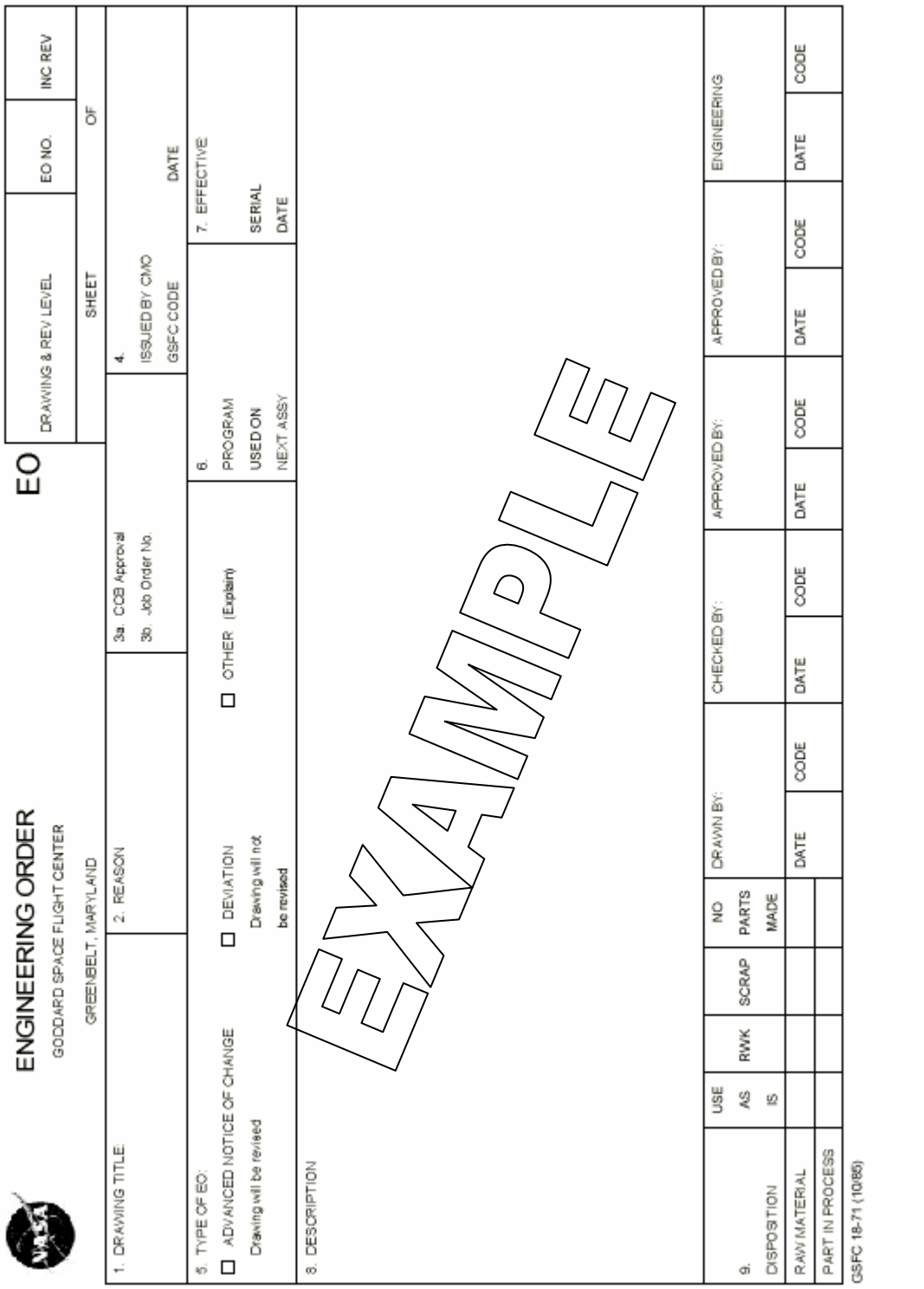


Figure 4-3. Example of Engineering Order (EO) Form (1st Page)

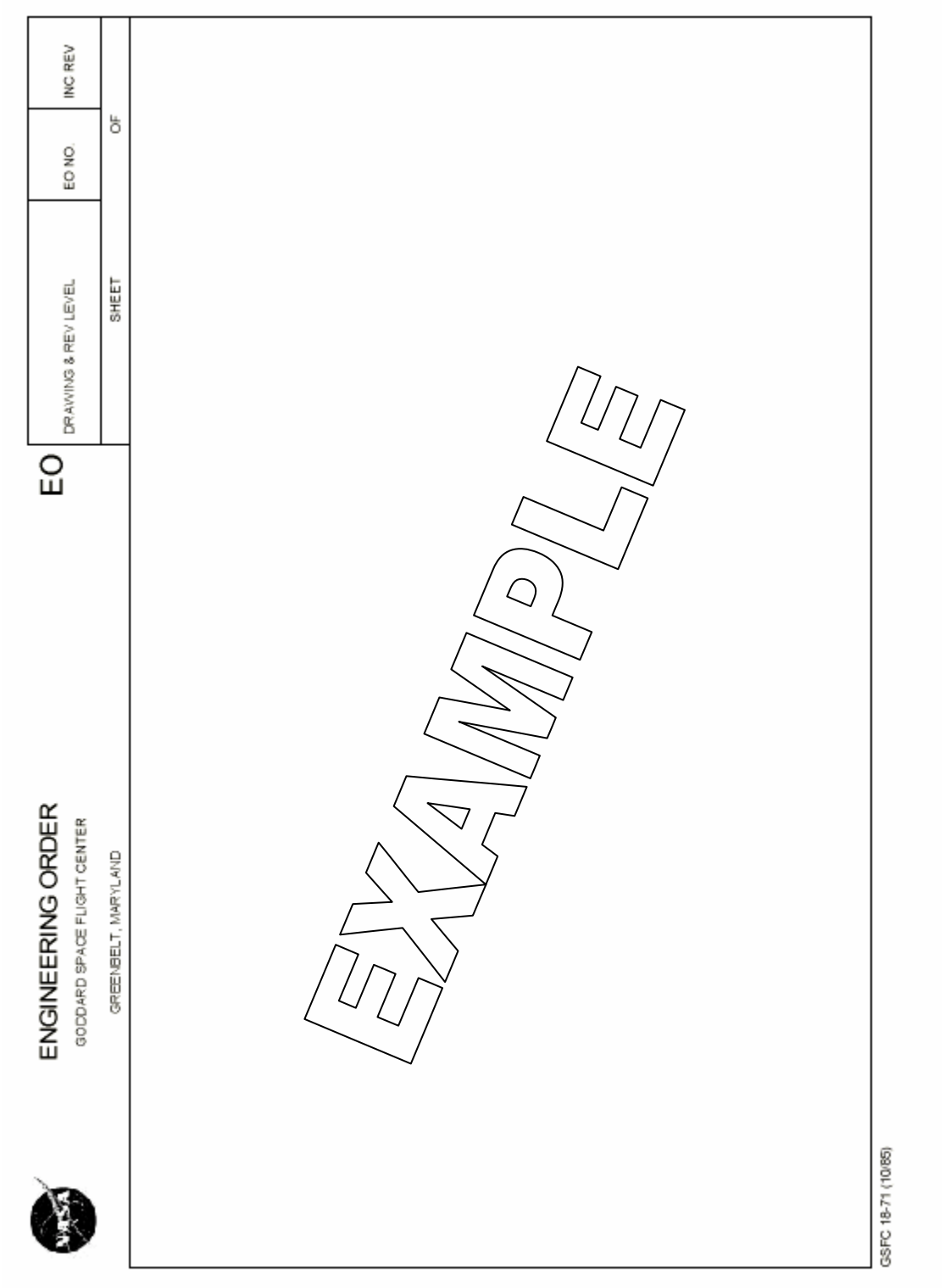


Figure 4-3. Example of Engineering Order (EO) Form (Continuation Pages)

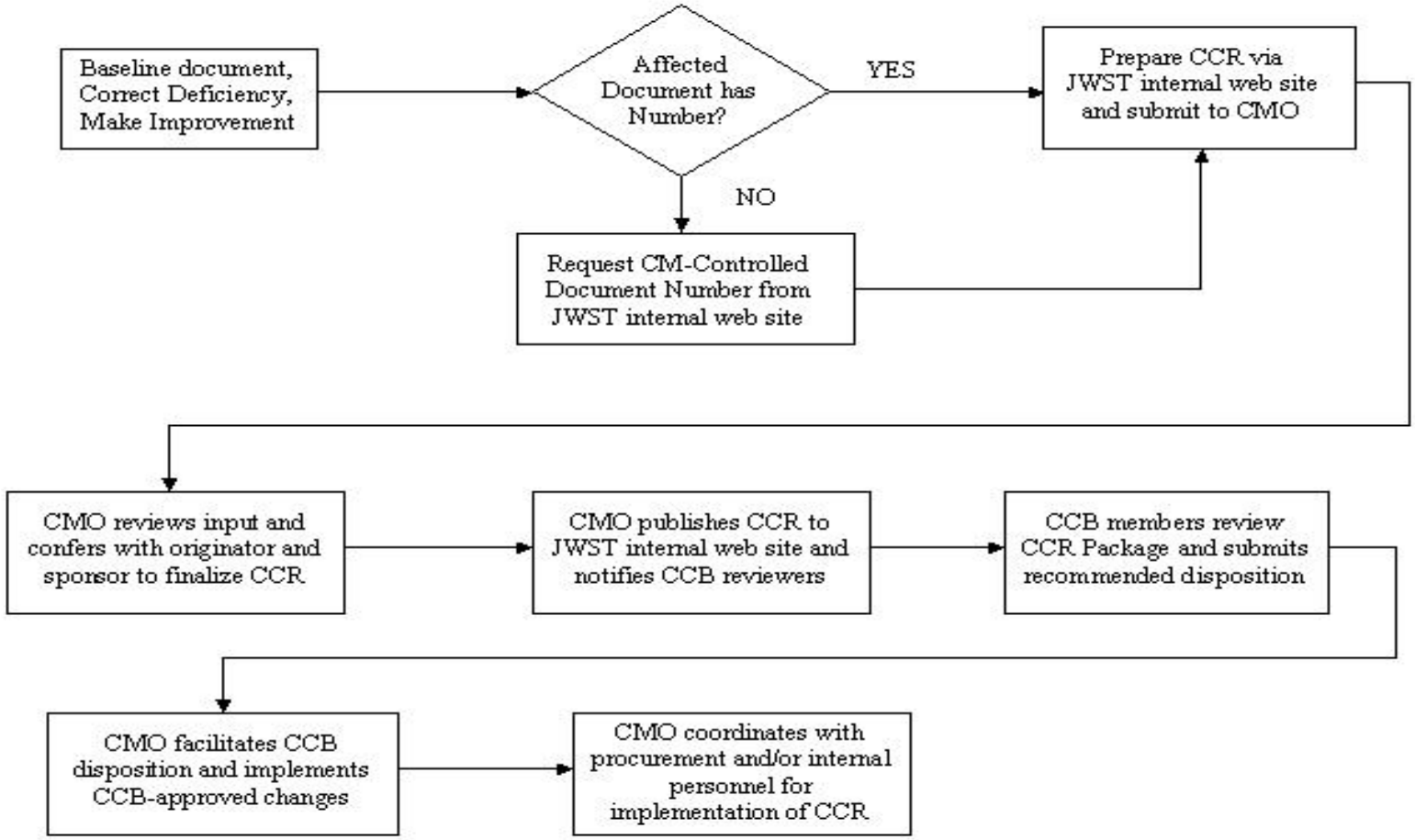


Figure 4-4. JSWT Project CCR Flow

4.4.1.4 Change Proposal Priority

The CMO (in conjunction with the CCR sponsor) shall recommend a priority to the proposed change. The CCB Chairperson shall determine final priority. Three priority levels shall be used:

- **Emergency**. This priority shall be assigned when failure to implement a change in operational characteristics may seriously compromise the effectiveness of the equipment or when a hazardous condition exists that may result in fatal or serious injury or extensive damage or destruction of the equipment. Emergency changes shall be dispositioned within 24 hours of receipt by the CMO. CCRs identified as "Emergency" will immediately be brought to the CCB Chairperson's attention and a CCB meeting will be convened as soon as possible.

- **Urgent**. This priority shall be used to effect a change that, if delayed, would cause schedule slippage or cost increase. Urgent changes shall be dispositioned within five (5) business days of receipt by the CMO.

- **Routine**. This priority shall be used when the conditions specified in the Emergency and Urgent priorities do not exist. Normal changes shall be dispositioned within ten (10) business days of receipt by the CMO.

4.4.1.5 Cost Estimates

Cost estimates are required for every proposed CCR. When a proposed change has a cost impact, a ROM will be required as part of the CCR. In addition, the impact assessment statement must include positive, negative, and/or no impact assessment, as appropriate. The CCR sponsor is required to analyze the ROM for accuracy. For CCRs that have a high cost impact, an in-house estimate may need to be included as part of the CCR package. Any cost estimate accompanying a CCR should be treated confidentially. The sponsor and CMO will consider each CCR for this purpose and take appropriate measures against unnecessary or unintentional release.

4.4.1.6 Preparation of CCR Package

The CMO is responsible for compiling a complete master CCR package that will be maintained by the CMO as a case file for historical purposes. The CCR package will include, at a minimum, the following items:

- CCR Form (original signature on file), attachments, and all revisions
- CCR Transmittal Letters
- CCR Review Comments
- Contractor Correspondence
- Project Correspondence (including e-mail correspondence)
- Contractual Direction
- CCB Agenda
- CCB Minutes

- Copy of Procurement Requests (Originals on File with CO)
- Rough Order of Magnitude (ROM)

4.4.1.6.1 CCR Revision

The contents of a CCR package may change as it evolves during the review process. When and if it becomes necessary to revise a CCR, it must be done prior to the CCB Chairperson's approval. All changes to the CCR must be submitted and coordinated with the CMO for incorporation into the original CCR package. The CCR number will be revised to indicate the date of the revision and to ensure that the latest version of the proposed package has been identified. The CCR number is revised to add R1, R2, R3, etc., (i.e. JWST-CCR-000110R1).

4.4.1.6.2 Contractual Implementation of Approved CCRs

The JWST CMO will submit CCR packages to the CO for contract modification preparation. A procurement request (PR) shall be generated for each approved change that affects a contract. The CO will proceed under the appropriate procurement procedure to achieve contractual implementation by the required date imposed by the CCB.

The JWST CMO shall update the affected document with all approved changes after the appropriate parties sign the contract modification. If changes are made to the affected contract documentation during negotiations, the CO shall provide the JWST CMO with a letter delineating the changes. The JWST CMO shall update the CCR file and database to reflect the agreed-upon changes and submit updated change pages to the CO for inclusion in the contract.

4.4.1.6.3 Verification of Change Implementation

Verification of change implementation for documentation is the responsibility of the CMO. Verification of change implementation for CIs is the responsibility of the QA Representative. These verifications occur after the responsible implementers have completed the change(s) and notified the CMO. Verification is necessary to ensure proper implementation of CCB decisions.

4.4.1.6.4 Disposition of Internally Generated CCRs

The JWST Project will from time to time make changes that affect the external community. In the course of updating controlled documentation, external organizations occasionally make changes that affect the external community. The JWST System Engineer shall verify and determine the proper scope of the affected organization and review all internally generated CCRs. CCRs will then be routed to these organizations for approval and concurrence.

4.5 JWST BASELINE DOCUMENTS

The JWST CMO shall maintain all GSFC JWST CM-controlled documents. The *JWST CM-Controlled Document Style Guide* (JWST-HDBK-000668) details the format requirements to be followed when preparing JWST CM-controlled documents. The latest version of the approved

baseline document will be available online. The user shall always check the JWST CDL to verify the correct version of the document prior to use. Baseline documents include requirements documents, Interface Requirements Documents (IRDs), ICDs, MOAs, MOUs, LOAs, Project Implementation Plans, specifications, contract documents, SOWs, Mission Assurance Requirements (MARs), and Contract Deliverable Requirements documents.

When the document is determined to be complete, accurate, and ready to baseline, the author/sponsor shall prepare and submit a CCR to the CMO. The CCR form and the proposed original document will be forwarded to the appropriate CCB members for review. The document will be considered approved once CCB members and the Chairperson approve the CCR. CM technical publications will begin upon CCB approval. Formal document signature cycle will begin after CCB approval to obtain all signatures on the original document signature page. Once all signatures have been obtained the CMO will formally release the document and post it on the JWST website. Any JWST Project-controlled documents that have not been formally baselined shall be marked "**DRAFT**".

4.6 DOCUMENT REVISIONS

A revision is a complete reissue of a document. Identification numbers for revised documents will be the original identification number followed by a sequential revision letter. Each revised document will include all changes that have previously been approved. Change bars are located in the right-hand margins and will appear adjacent to the line or paragraphs where nomenclature has been added, changed, or deleted from the previous issue of the document. Documents printed on two sides will bear the change bar, if used, on the margin opposite the bound side. No editorial or other changes shall be made during revisions unless approved by the CCB.

4.7 DRAWING CHANGE PROCESS

The submitting individual has the authority to decide if a particular drawing change needs to be incorporated immediately; however, no more than five EOs shall be written against a drawing. Upon release of the fifth EO, a copy of all EOs shall be forwarded to the drafter for incorporation.

The submitting individual or drafter making the change(s) is responsible for obtaining the checker's signature on the drawing, if required. **NOTE:** The checker's name shall be independent from all other names on the drawing. Then, the drafter shall upload unapproved drawing (CAD file) into the CM incoming directory located on the network and notify the CMO either by e-mail or telephone that the drawing is ready for release. The CMO facilitates the review and approval process.

Once approval is received, the CMO updates the drawing to indicate approval and will release the drawing. The CMO will covert the drawing to PDF and notify Project personnel via e-mail of their availability. The CAD file should reflect the names of all of the authorizing individuals in the revision block of the drawing. The CAD files are named using the drawing numbers supplied by the CMO (i.e.,1555200A1.dwg).

If drawings submitted to the CMO are not in electronic format, the revised paper drawing, with signatures, must be submitted to the CMO. The hardcopy drawing submittals will be scanned, converted to PDF, and uploaded to the website.

4.7.1 Drawing Changes

EO shall be used for the purpose of revising released drawings and shall be submitted to the CMO in accordance with the *GSFC Engineering Drawing Standards Manual* (500-PG-8700.2.5). The EO shall contain an explanation of *Why* the change is required, description of the *Was* and *Is* configurations, identification of affected systems and definition of required approval signatures. The PDL, or designee, shall review the submittals for completeness of information and accuracy.

4.7.2 Drawing Standards for Revisions

In order to maintain an efficient and controlled revision process, the CMO complies with the procedures described in *GSFC Engineering Drawing Standards Manual* (500-PG-8700.2.5). Revisions to any sheet(s) are recorded in the revision description block on Sheet 1 of the drawing. The following requirements apply:

a. when a drawing is revised, the revision description block on the first sheet should state "Incorporated EO Number X" or "Revised Per EO Number X". No other explanation is required. If the drawing has gone through GSFC checking and the checker requires a brief description of the change in the revision block, the EO number must still be referenced.

b. revision symbol call-outs in the field of a drawing (as requested in 500-PG-8700.2.5) are unnecessary due to the specificity of the EO process used, and therefore not required. In the event that changes are made to a drawing without an EO, the revision symbol call-outs are required in the field of the drawing.

c. when the first revision (Revision A) is made to a drawing, it is the responsibility of the drafter to copy previous title block information (including Designer, Designed By Date, Drawn By, Drawn By Date, Checked By, Checked By Date, Approved By, and Approval Date) exactly as it appears on the original drawing. This information can be easily obtained either by phoning CM personnel, by viewing the original in the CMO, or by viewing online.

d. all sheets of a multi-page drawing will require an approval signature.

e. when one drawing replaces another (other than a previous revision), this shall be placed in ¼-inch-high lettering directly above the title block.

4.8 CMO TECHNICAL PUBLICATIONS

The JWST CMO is responsible for complete technical publications for all documents under JWST Project CCB control. Documents that require CCB level approval have been identified by JWST management and are located on the *JWST Project Document Tree*, JWST-TREE-000659. Once the CCB chairperson has approved the changes, the CMO will prepare a final clean version. The Master copy of the document shall be kept on file in the CMO and a PDF copy shall be delivered to the JWST Project Data Manager to be made available on the JWST internal website.

4.9 DEVIATIONS AND WAIVERS

4.9.1 Deviations

A Deviation is a specific written authorization, granted ***prior to*** the manufacture or testing of an item, to depart from a particular performance or design requirement of a specification, drawing, or document for a specific number of units or time. A deviation cannot require revision of the applicable document. An approved engineering change is required for revision of the document that defines the affected item. Critical and major Requests for Deviations are processed as Class I CCR and undergo the same approval routing as configuration changes. Each request for deviation shall be designated as minor, major, or critical. Minor deviations shall be processed through the MRB.

4.9.2 Waivers

A Waiver is a specific written authorization, granted ***after*** the manufacture or testing of an item that, during production or after having been submitted for inspection, is found to depart from a particular performance or design requirement of a specification, drawing, or other document, but is considered suitable for use "as is" or after rework by an approved method. Each request for a waiver shall be designated as minor, major, or critical. Critical and major Requests for Waivers are processed as Class I CCR changes and undergo the same approval routing as configuration changes. Minor waivers shall be processed through the MRB.

4.9.3. Classification of Deviations and Waivers

4.9.3.1 Minor Deviations and Waivers

Deviations and waivers are classified as minor if they consist of a departure that does not involve safety, performance, interchangeability, reliability, or maintainability of the item or its repair parts, effective use or operation, weight, or appearance.

4.9.3.2 Major Deviations and Waivers

Major deviations and waivers are ones that consist of a departure involving any one or all of the factors listed above, with the exception of safety.

4.9.3.3 Critical Deviations and Waivers

Deviations and waivers are classified as critical if they consist of a departure from a characteristic in the documentation that involves safety.

4.9.4 Processing of Deviation and Waivers

All deviations and waivers constitute changes to the "contract" and, as such, shall be processed through the CCB system. Deviations and waivers shall be written on the Request for Deviation/Waiver form, attached to a JWST CCR form, and submitted to the CMO for CCB processing.

4.9.5 Approval of Deviations and Waivers

Minor deviations and waivers shall be dispositioned by the MRB. Major and critical deviations and waivers shall be dispositioned only by the CCB and signed by the CCB Chairperson or designee.

All dispositioned changes shall be documented in either a contract modification form or an approval letter.

When implementation and notice of completion information is sent to the Project CMO, the CMO closes out the CCR tracking data and archives the information.

For all JWST CM-controlled documents, a listing of all deviations and waivers affecting CM-controlled documents shall be document in an appendix of the document. The appendix shall contain a listing, which shall include, as a minimum, the Deviation/Waiver Number; CCR number; date approved; and brief description of the deviation/waiver.

5.0 CONFIGURATION STATUS ACCOUNTING

Configuration Status Accounting is the recording and reporting of all JWST Project approved documentation and drawings that identifies established baselines and the proposed and approved changes to these baselines. The CMO is responsible for recording, maintaining, and reporting the information needed for managing the configuration effectively, including a list of the approved configuration identification, the status of proposed changes to the configuration, and the implementation of the approved changes. The Configuration Status Accounting system generates reports that provide the various JWST Project management personnel with essential data on configuration identification and control. Comparison of these data with the fabricated and tested CIs will enable the JWST Project management personnel to verify that each CI meets all Project and contractual requirements.

These reports will include a list of proposed configuration changes, the status of the proposed changes and any associated action items, WOA status (i.e., open, closed, past due), Drawing/EO/PL status (i.e., revision level, number of EOs, date released), and CCR action items status (i.e., open, closed, past due).

A documentation change log will be maintained for each controlled document identifying the current change status and the document change history. The data shall be used by the Project CMOs to track the receipt, approval status, implementation of approved changes, and document change status.

6.0 CONFIGURATION MANAGEMENT AUDIT

The JWST Project CMO is responsible for ensuring that the CM discipline in this procedure is implemented throughout the JWST Project in accordance with the standards and policies established by this procedure. Audits of CM activities (CM System Audits) within Project organizations may be planned, conducted, and recorded to ensure implementation of this Procedure as directed by the Project Manager or designee. Non-conformances will be reported via the Non-Conformance Reporting/ Corrective Action (NCR/CA) System database in accordance with *Control of Non-Conforming Product* (GPG 5340.2).

The purpose of configuration audits is to prove that the actual configuration of CIs conforms to the intended configuration (the "as-built" configuration matches the "as-designed" configuration). Configuration audits validate the accomplishment of development requirements (Functional Configuration Audit) and achievement of a production configuration through comparison with the CI's technical documentation (Physical Configuration Audit).

6.1 AUDIT TEAM

Audits will be scheduled and audit teams appointed at the Project Manager's (or designee's) discretion. The required membership of the audit team depends on the complexity of the equipment, the volume and type of documentation associated with the hardware, and the depth and detail of the documents to be audited.

6.2 CONFIGURATION MANAGEMENT OFFICER RESPONSIBILITY

The CMO will conduct configuration audits at the Project and external organization levels, per direction from the JWST Project Manager. This audit process ensures that CM procedures are being adhered to and properly implemented and that CCBs are not being bypassed.

The Project will conduct a CM system audit at the provider's facility soon after the contract or agreement has been signed (prior to PDR) to ensure that the provider has a CM system in place and is in compliance with the Project's CM requirements. The Project will conduct additional audits as the Project matures to determine that the provider system is functional and the "as-built" products are consistent with the "as-designed" documentation, and that the documentation and products incorporate any approved changes.

The CMO (or representative) will provide a brief status report with the results of any CM audit. This may take the form of an e-mail to the Project Manager, DPM, DPM/R, and the cognizant COTR or similar manager.

The CMO is responsible to ensure that each JWST supporting organization (e.g., contractor, major subcontractor, international partners, in-house builds) have capable CM personnel to manage their respective mission development activities. The CM Auditor will provide on-the-spot guidance or training to correct minor deficiencies. Any remaining deficiencies in capability, in addition to recommended corrective actions, should be brought to the attention of the JWST DPM/R as soon as identified.

6.3 QUALITY ASSURANCE REPRESENTATIVE RESPONSIBILITY

The QA Representative shall review and verify that CIs are in conformance with the respective Project's requirements at designated milestones to assure that approved performance, quality, safety, and maintainability requirements are met. The QA Representative shall assure that any CI changes resulting in a hardware change will not be closed out until it is confirmed that the approved hardware or software changes have been correctly implemented.

6.4 INTERNAL PROJECT AUDITS

The CMO will continually monitor all tasks involved in the CM function to ensure that the CM procedures are being adhered to and properly implemented. The periodic audits will include evaluating all document operations (including the release of documents, drawings, EOs, and CCRs), review of all CCRs for completeness, and review of contract modifications and technical directions to ensure the CCB is not being bypassed.

6.5 EXTERNAL ORGANIZATION AUDITS

The CMO is responsible for performing audits, as requested by the Project Manager, of the mission external organizations and their suppliers' CM systems to ensure their CM practices are sufficient and compatible with the requirements of this Procedure. These audits will generally be scheduled approximately during the timeframe of each PDR and CDR and may be supplemented by additional audits when deemed necessary by the Project Manager. Items to be covered during the audit are as follows:

- Configuration and data management responsibilities
- Configuration identification and identification of changes
- CCB activities and responsibilities
- CCR classification procedures
- Subcontractor/vendor control procedures
- Change review procedures
- Document change processing
- Document release procedures
- Interface control procedures
- Change verification

Subcontract audits will be conducted in conjunction with the contractor's CM staff.

7.0 EXTERNAL ORGANIZATION CONFIGURATION MANAGEMENT SYSTEMS

External organizations supporting the JWST Project shall have a formal documentation control CM system that is capable of:

- Defining the hardware/software by drawings, specifications, and appropriate documentation
- Controlling all changes to the defined configuration baseline
- Verifying the hardware/software configuration is in accordance with the documentation
- Ensuring all changes are properly classified
- Preventing incorporation of unauthorized changes into the hardware/software or documentation

7.1 EXTERNAL ORGANIZATION CONFIGURATION CONTROL BOARD

External organizations (see Section 2.3.2) shall establish a CCB chaired by the external organizations Project Manager and staffed by the external organization's CMO and any external organization support staff as determined by the Board Chairperson (i.e., management, engineering, manufacturing, QA, and contract personnel).

The external organization's CCB shall be structured to provide an effective management tool for evaluating, approving, and maintaining configuration control or hardware and software changes. These boards will provide a disciplined means for reviewing and evaluating all proposed changes that affect engineering drawings, specifications, procedures, or other JWST Project baseline material changes. The boards will also be responsible for ensuring that changes, having interface requirements with other organizations participating in the JWST Project, are coordinated and concurred ***prior*** to implementing the change. The detailed operational procedure for processing changes by the CCB shall be documented in the external organization's GSFC-approved CM plan.

External organization Class I CCRs (JWST CCR Form) shall be forwarded directly to the GSFC JWST Project CMO. **NOTE:** The JWST CMO will forward to the appropriate JWST CCB Level representative for review. Upon concurrence, the JWST CMO will prepare and attach a GSFC JWST CCR form to the external CCR for processing through the JWST CCB process. Changes that require expedited action will be transmitted by the most expeditious means (i.e., electronic mail or FAX and telephone) to the GSFC/JWST Project Manager or, in his absence, to the Deputy Project Manager. If the original communication is by other than written message, it shall be confirmed by written message within 24 hours.

Class II changes will not require the submission of a CCR for GSFC approval. However, all external organization-approved Class II changes shall be subject to review by a Project representative (generally the Government Sponsor) for concurrence of proper classification.

7.2 EXTERNAL ORGANIZATION CONFIGURATION MANAGEMENT OFFICE

A CMO shall be established within the external organization. A Configuration Management Officer, or designated representative, shall be responsible for maintaining the external organization's CM requirements and shall ensure the external organization's compliance through implementation of appropriate company configuration identification, authorization, control, and accountability systems and procedures. The external organization CMO is also responsible for implementing the configuration identification, change control, status accounting, and audit requirements of this document, as well as the administrative functions associated with the operation of the CCB and the preparation and review of CCRs by the CCB. Finally, the external organization CMO is responsible for preparing and maintaining its CM Plan.

8.0 DATA MANAGEMENT RESPONSIBILITIES

The Data Manager is responsible for coordinating the delivery of contract deliverables; establishing and maintaining a schedule of all external organization deliverables and their status; identifying, collecting, logging, scheduling, processing, tracking and controlling external organization deliverable documents, Project-controlled documents, miscellaneous documents, and correspondence; appraising management of the status of active data items and schedules along with reporting and data scheduling problems; maintaining the library external organization deliverables, presentations, photographs, video tapes, software, reference material as well as Project-related documentation; and maintaining the online library catalog in accordance with the *JWST Project Data Management Procedure* (JWST-PROC-000655).

APPENDIX A. ABBREVIATIONS AND ACRONYMS

ABBREVIATION/ ACRONYM	DEFINITION
ARC	Ames Research Center
CAD	Computer Aided Design
CCB	Configuration Control Board
CCR	Configuration Change Request
CDR	Critical Design Review
CI	Configuration Item
CM	Configuration Management
CMO	Configuration Management Office(r)
CO	Contracting Officer
CSA	Canadian Space Agency
DCN	Document Change Notice
DPM/R	Deputy Project Manager/Resources
DWG	drawing
EO	Engineering Order
ESA	European Space Agency
GDMS	Goddard Directives Management System
GPG	Goddard Procedures and Guidelines
GSE	Ground Support Equipment
GSFC	Goddard Space Flight Center
HDBK	handbook
ICD	Interface Control Document
IRD	Interface Requirements Document
ITAR	International Traffic in Arms
JPL	Jet Propulsion Laboratory
JSC	Johnson Space Flight Center
JWST	James Webb Space Telescope
KSC	Kennedy Space Center
LOA	Letter of Agreement
LMATC	Lockheed Martin Advanced Technology Center
MAR	Mission Assurance Requirement
MCDL	Master Controlled Document List
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NCR/CA	Non-Conformance Report/Corrective Action
NSTS	National Space Telescope System
NTE	not to exceed
PDF	Portable Document File

ABBREVIATION/ ACRONYM	DEFINITION
PDL	Product Design Lead
PDR	Preliminary Design Review
PDT	Product Design Team
PG	Procedures and Guidelines
PIP	Payload Integration Plan
PL	Parts Lists
PR	Procurement Request
QA	Quality Assurance
QMS	Quality Management System
RFP	Request for Proposal
ROM	Rough Order of Magnitude
SAM	System Assurance Manager
SOW	Statement of Work
STScI	Space Telescope Science Institute
WOA	Work Order Authorization

APPENDIX B. JWST PROJECT PROCESSING PROCEDURES FOR INTERNATIONAL PARTNERS RELATING TO JWST DOCUMENTS, CONFIGURATION CHANGE REQUESTS, DEVIATIONS, AND WAIVERS

(THIS SECTION TO BE DETERMINED)